2016 ESA/NASA ExoMars/Trace Gas Orbiter

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MEPAG
June 16, 2011

National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology

Artist's concept

Overview

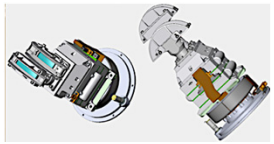
- Joint ESA-NASA Mars Orbiter
  - Proposed launch in 2016
- Deliver ESA EDM
- 1 Mars year orbital science mission
- Telecom asset until 2022

Contributions

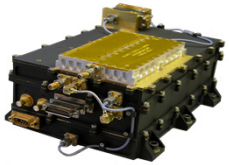
National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology

NASA / JPL Proposed Mission Elements

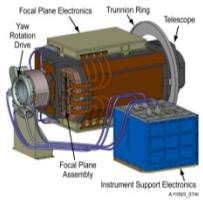
EMCS



MAGIE



Electra



MATMOS

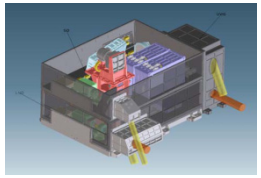
Atlas-V – Baseline Class

JPL-JG1

JPL DSN

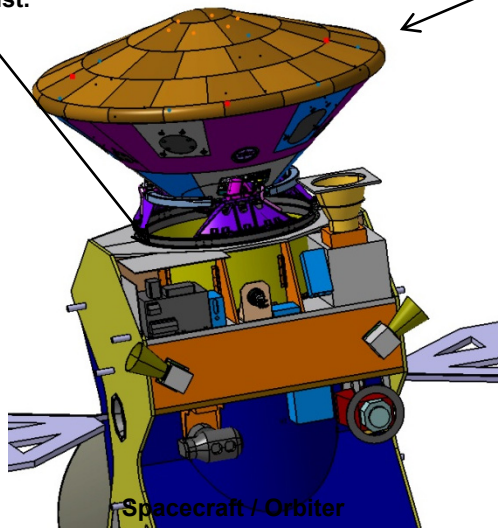
JPL SRA

ESA Mission Elements



NOMAD Inst.

Entry / Descent Module (EDM)



ESA ESTRACK

ESA ESOC

2016 ExoMars/TGO

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JPL-JG1 LV not selected yet
Janis Graham, 5/18/2011

EMTGO Mission Events *(proposed)*

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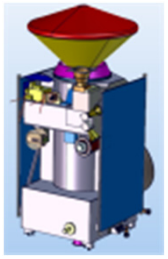
LAUNCH

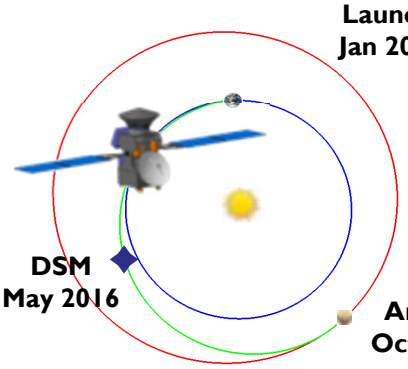
Jan 2016



EMTGO in launch configuration

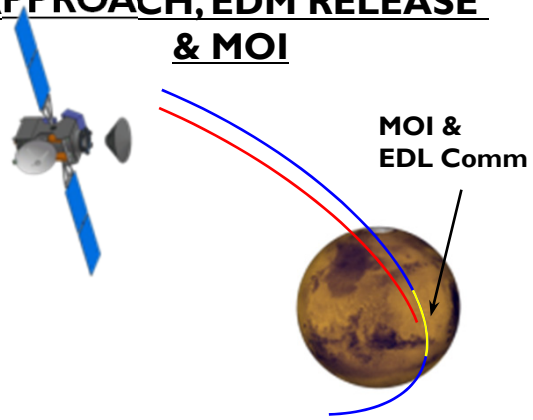
Atlas V 431

INTERPLANETARY CRUISE



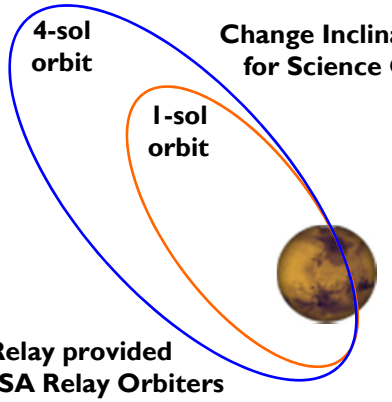
Type II Trajectory: C3 = 7.44 km^2/s^2

APPROACH, EDM RELEASE & MOI



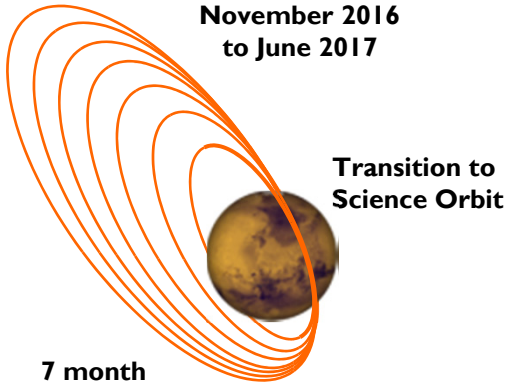
- EDM release at MOI - 3 days
- Orbiter retargets to MOI altitude
- MOI captures to 4 sol orbit

EDM RELAY & TRANSITION TO 1-SOL ORBIT



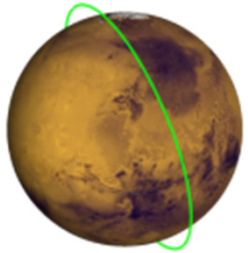
EDM Relay provided by NASA Relay Orbiters

AEROBRAKING PHASE



7 month Aerobraking

SCIENCE & DATA RELAY PHASE



Science & Relay Orbit
- 400 km Frozen
- Rotates every 4 months
- Phased for 2018 Relay

- Science Phase: 1 Mars Year 6-2017 to 6-2019
- Relay Phase: 2018 Rovers Jan 2019
- Relay Phase: Future Missions through 2022

2016 ExoMars/TGO

Prioritized Science Objectives

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- Detect a broad suite of atmospheric trace gases and key isotopologues.
- Characterize the spatial and temporal variation of methane and other species that could be signatures of active biological and/or geological processes (for example, C_2H_6, SO_2, N_2O) and of photochemical species that determine atmospheric lifetimes (e.g., representative O_x, HO_x, NO_x species) and their source molecules (e.g., H_2O).
- Localize the sources and derive the evolution of methane and other key species and their possible interactions, including interactions with atmospheric aerosols and how they are affected by the atmospheric state (temperature and distribution of major source gases; e.g. H_2O).
- Image surface features possibly related to trace gas sources and sinks.

Proposed Payload

National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology

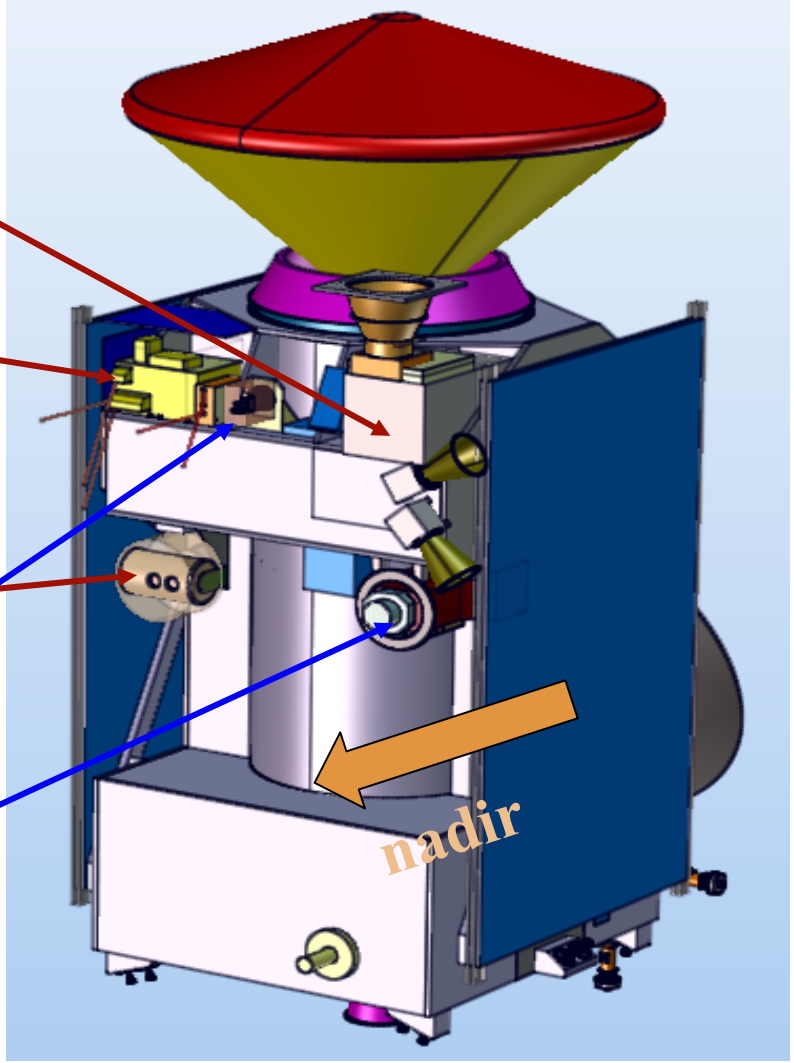
MATMOS
Solar occultation Fourier transform IR spectrometer *(w/ Canadian contribution)*

NOMAD
Occultation + mapping IR, Vis, UV spectrometer
(consortium of Belgium, Spain, Italy, UK)

EMCS
Thermal IR spectrometer

MAGIE
Wide-angle Vis-UV camera

HiSCI
High resolution, colour, stereo camera *(w/ Swiss contribution)*



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JPL-JG3 Is this all of the instruments?
Janis Graham, 5/18/2011

Solar occultation

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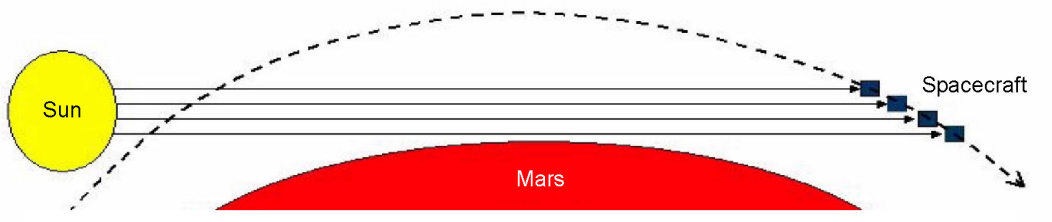
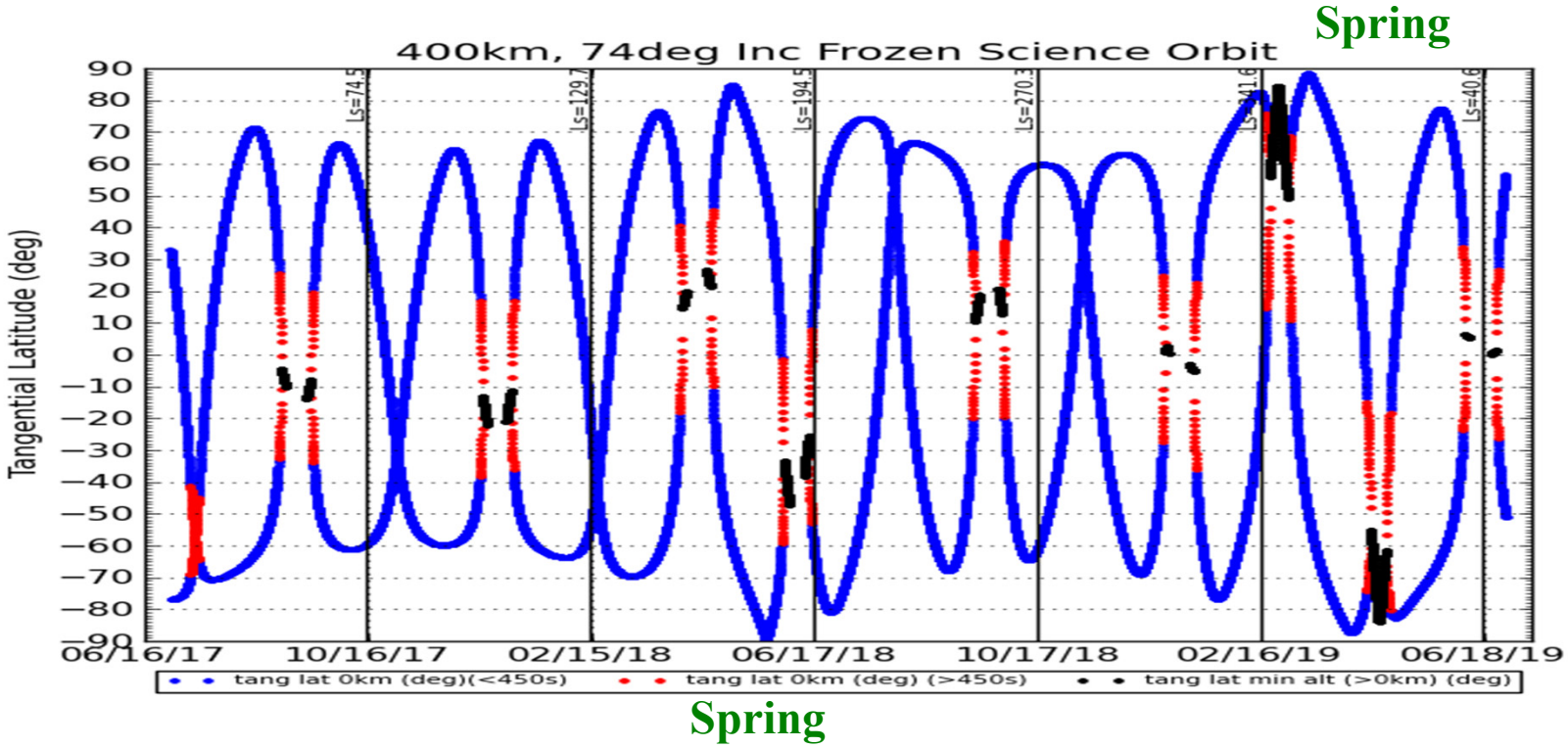
- Ultrahigh sensitivity
  - Bright light source
  - Long pathlength
- Orbit inclination: 74º





Nadir mapping

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- Ground track for 3 days